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CLINICAL NOTES

Imaging Diagnosis of Spinal Intramedullary Tuberculoma: Case Reports and Literature Review

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Received March 12, 2009; accepted July 23, 2009

Abstract

Background/Objective: Spinal intramedullary tuberculoma is rare, accounting for 2/100,000 of cases of tuberculosis and only 2% of all cases of tuberculosis of the central nervous system. Diagnostic imaging is essential to improving diagnosis and management of this disease.

Methods: The clinical profile, radiological data, and histological slides of 2 cases of intramedullary tuberculomas confirmed by pathologic examinations were reviewed.

Results: In 2 cases, magnetic resonance imaging (MRI) showed thickening of the spinal cord and oval lesions with a low T1-weighted image signal and a typical ''target sign'' T2-weighted image signal. After gadopentetate dimeglumine administration, the lesion's rim shape was enhanced, showing uneven wall thickness and sharp margins.

Conclusions: MRI findings of spinal intramedullary tuberculoma were specific, and accurate diagnosis could be obtained. MRI is the optimal measure because it shows location, size, and number of lesions and the presence of degeneration and necrosis.

J Spinal Cord Med. Apr 2010;33(2):159–162

Key Words: Tuberculoma; Spinal cord; Tuberculosis, central nervous system; Magnetic resonance imaging

INTRODUCTION

Spinal intramedullary tuberculoma is rarely seen; since it was first reported by Cascino and Dibble (1) in 1956, there have been only occasional case reports. In 2002, Sharma et al (2) reported the largest group of spinal intramedullary tuberculoma. We summarized the image findings of 2 cases of spinal intramedullary tuberculoma, which were confirmed by pathologic examinations, and reviewed the literature to improve diagnosis and management of this disease.

CASE REPORT

Case 1

A 15-year-old boy was admitted complaining of continuous back pain for 1 year and asthenia of his left hand for 5 months. Physical examination revealed his left upper limb was obviously thinner than the right upper limb, and the left biceps reflex, left knee reflex, and left cremaster reflex were not induced. There was hyperalgia on the left side, and sensations on the left side were more acute. A computerized tomography (CT) scan showed spot-like high density shading in the upper and lower lobes of the 2 lungs and enlarged mediastinal lymph nodes (Figure 1A). Cervical magnetic resonance imaging (MRI) showed a thickened and swollen spinal cord in the cervical and upper chest segments, and the T2-weighted image (T2WI) signal was enhanced in most spinal cord segments. In C4, an oval 2 $\times$ 1-cm lesion was observed, the T1-weighted image T1WI signal was slightly weakened, and the marginal signal was slightly enhanced, with an ill-defined margin. The T2WI signal was weak in most of the central part and had enhanced margins in a rim shape. A collarette-like weak signal could be observed in the exterior margin, with sharp margins and ''target sign'' change. After gadopentetate dimeglumine was administered, obvious rim enhancement could be observed with uneven wall thickness and sharp margins (Figure 1B–D). Pathologic examination showed large patches of caseous necrosis and necrotized peripheral epithelioid cells, with multinucleated giant cells and lymphocytes.

Case 2

A 40-year-old man was admitted for weakness, numbness, and pain in both lower limbs for 5 days and urinary retention for 2 days. Physical examination showed muscular atrophy in all 4 limbs, hyperalgesia below the

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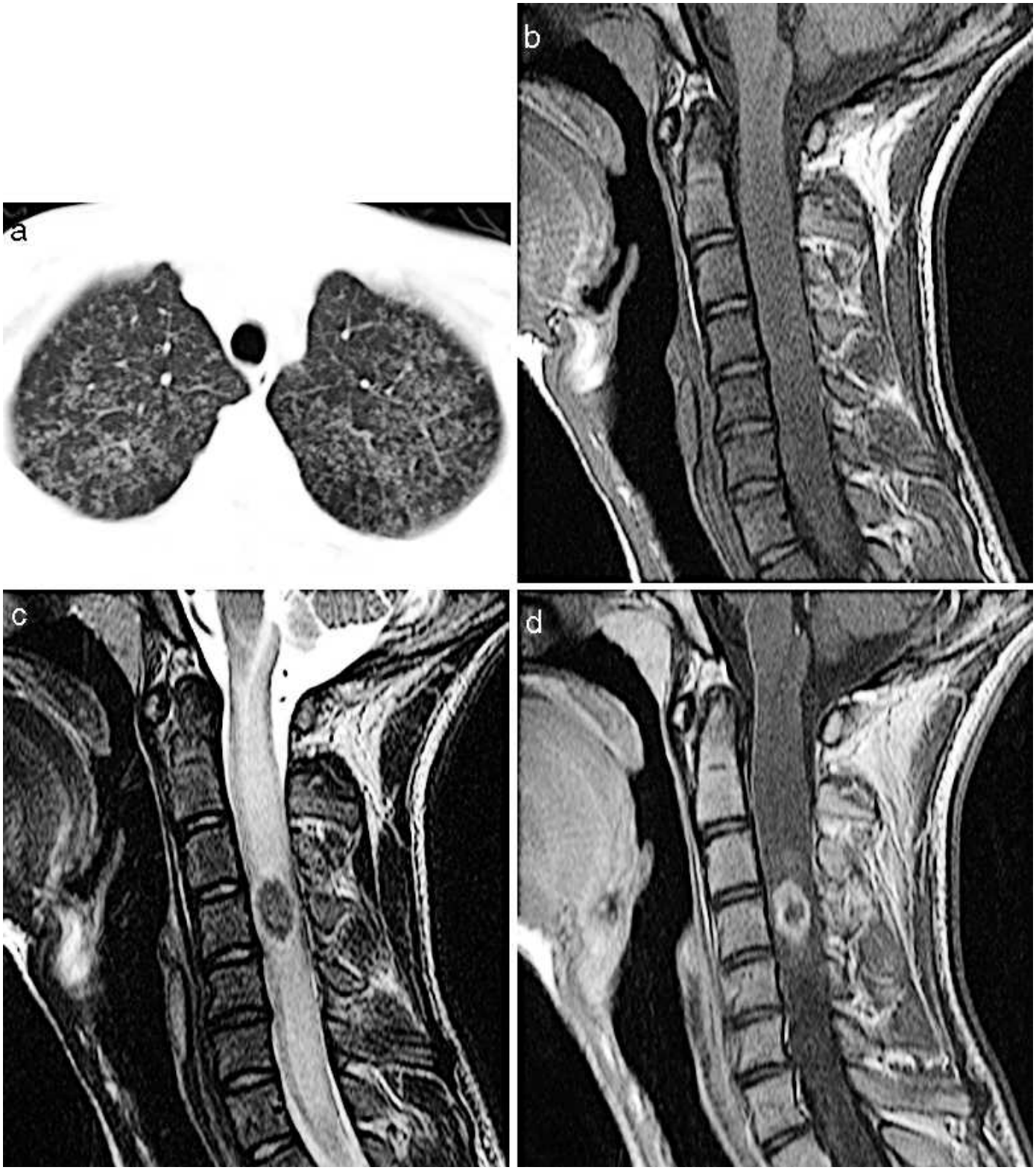

Figure 1. *(a) Chest CT shows spot-like shades of high density in both upper lobes. (b) Vertical MRI: T_1WI shows swollen cervical spinal cord, low signal in the lesions, and an ill-defined margin. (c) Vertical MRI: T_2WI shows typical ''target sign'' in spinal lesion at C4. The remaining spinal cords are swollen with intensified signals. (d) Enhanced vertical MRI: T_1WI shows obvious irregular rim enhancement in spinal lesions.*

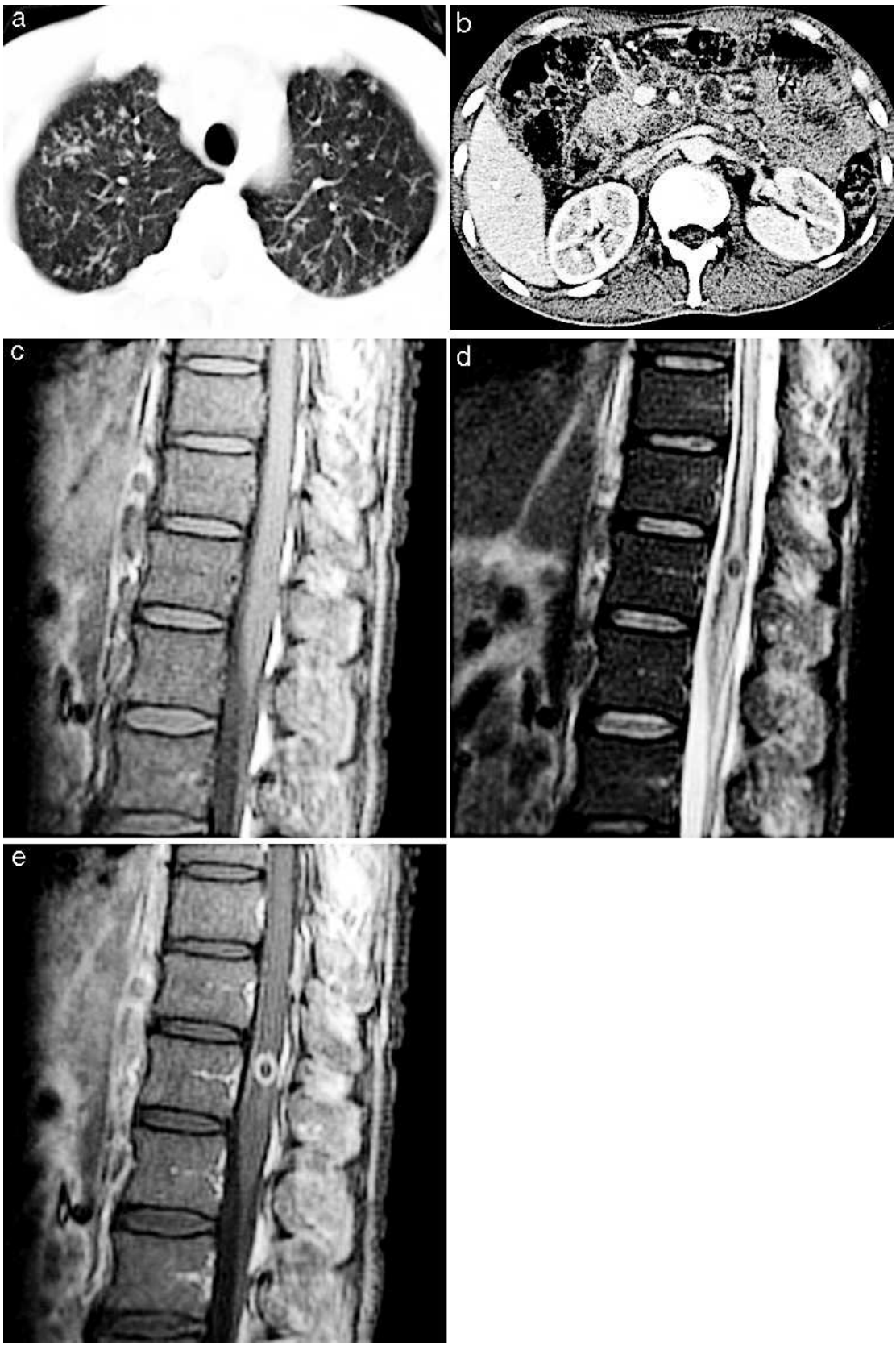

Figure 2. *(a) Chest CT shows spot-like shades of high density. (b) Abdominal CT shows multiple irregular nodular shades of lower density around the pancreas and in the retroperitoneal space, with a slightly intensified margin. (c) Vertical MRI: T_1WI shows oval lesions at T12, with low signal and a relatively sharp margin. (d) Vertical MRI: T_2WI shows typical ''target sign'' in spinal lesion at T12, as well as a slightly swollen thoracic spinal cord and intensified signals. (e) Enhanced vertical MRI: T1WI shows even rim enhancement of the spinal lesion.*

level of L2, hyporeflexia of the patellar tendon on both sides, and decreased sense of joint position in both lower limbs. A chest CT scan showed multiple small nodular shades of high density in both lungs and a patch-like shade of relatively high density in the upper lungs (Figure 2A). An abdominal CT scan showed multiple small nodular shades of relatively high density at the hepatic hilum, in the pancreas, and in the retroperitoneal space, with margins slightly intensified after enhanced scanning (Figure 2B). Thoracic and lumbar vertebrae MRI showed an oval lesion of 1.1 $\times$ 0.9 cm at T12, with a slightly weakened T1WI signal and relatively strong signal at the margins, which was sharp. An obviously low T2WI signal could be observed in most of the central part, a rim-like high signal could be observed at the margins, and the margins were also sharp, with ''target sign'' changes. Obvious rim enhancement could be observed after gadopentetate dimeglumine was administered, with even wall thickness and sharp margins (Figure 2C–E).

DISCUSSION

Spinal intramedullary tuberculoma is a rare disease; its incidence among patients with tuberculosis is only 2/100,000, accounting for only 2% of all cases of tuberculosis of the central nervous system. The ratio of intramedullary tuberculoma to intracerebral tuberculoma is approximately 1:42, and 72% of lesions are located in the thoracic cord (3). It is unknown whether the disease specifically targets a particular sex or age.

Spinal intramedullary tuberculoma is mostly induced by hematogenous dissemination or cerebrospinal fluid infection; however, in a few cases, it is caused by local spreading of spinal tuberculosis. It is important to look for pulmonary tuberculosis or extrapulmonary tuberculosis in patients with spinal intramedullary tuberculomas. Tubercular lesions were found during chest examinations in the 2 patients in this study, and retroperitoneal tuberculosis was also observed in 1 case. These findings are important for the proper management of patients with spinal tuberculosis.

Chest radiographs and CT scanning are effective measures for the detection of pulmonary tuberculosis and extrapulmonary tuberculosis. For spinal intramedullary tuberculosis, MRI is the optimal measure because it can accurately show location, size, and number of lesions, as well as whether there is degeneration and necrosis around the lesions. The differential diagnoses include common spinal intramedullary tumors, such as astrocytic glioma, ependymocytoma, and hemangioblastoma. The MRI findings in cases of spinal intramedullary tuberculoma can vary during the different phases of tuberculoma. In the early phase, the tuberculoma is characterized by severe infective reactions, poor formation of the gel capsule, and severe edema around the lesion. During this phase, T1WI and T2WI both show equal signal intensity and they are evenly enhanced after being intensified. As the gel content in the tuberculoma increases, the peripheral edema is alleviated or may disappear. As a result, T1WI shows equal signal intensity; meanwhile, T2WI shows equal or low signal intensity. After enhanced scanning, there is rim enhancement and low signal in the central region. With the development of caseation, T2WI shows a typical ''target sign'' (4,5), which means that it exhibits a range from the low signal target to the high signal rim and also from the center of the low signal rim to the peripheral parts. The caseous substance forms the target center, whereas the peripheral infective granulation tissues form the high signal rim. The low signal rim in the external region is composed of collagen fibers produced by fibroblasts. Because the contents of collagen fibers vary, the low signal rim may be incomplete or absent. The ''target sign'' is a valuable indicator that helps differentiate spinal tuberculoma from other intramedullary lesions. Rim enhancement is usually observed in spinal tuberculosis. Compared with tumors, spinal tuberculoma has a sharper margin and lower T2WI signals, and it is particularly easy to differentiate the disease when there is a ''target sign.'' Enhanced examination should be performed when diagnosis can not be obtained by plain scanning.

CONCLUSION

In these 2 cases of spinal intramedullary tuberculoma, the MRI findings were specific, and an accurate diagnosis was obtained, which was supported by the clinical data. For the diagnosis of spinal intramedullary tuberculosis, MRI is the optimal imaging technique.

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